

# Infectious Diseases and Potential Impacts on Survival of Fraser River Sockeye Salmon

Michael Kent

## Project 1

### Issues of interest to aquaculture

In this paper, Dr. Kent provides a good overview of several diseases and disease agents known to infect sockeye salmon. Of these, he describes **6 agents that he considers to be a high risk to sockeye salmon**. It is important to consider these agents as they may or may not relate to aquaculture. Pages in parentheses refer to the location of the reference in this review.

### Agents Classified as High Risk

1. **Infectious Hematopoietic Necrosis (IHN)** This disease has not been recognized in farmed salmon since 2003 and Kent re-iterates that the source of this virus for farmed salmon is in marine reservoirs (page 6).

The main emphases as they relate to aquaculture are that:

- The disease has not occurred for several years i.e. an outbreak of IHN is an unusual event and the virus does not reside on salmon farms;
- IHN is now a federally-reportable disease under the *Health of Animals Act* and any suspicion of the disease must be immediately reported to the Canadian Food Inspection Agency. This increases the likelihood of early detection of any infection
- Farms have enhanced their biosecurity and emergency management plans since 2003 and are better prepared to identify and respond early to a suspected event
- Approximately 75% of salmon farms, including all farms in the Campbell River area (Zone 3.2), vaccinate with a DNA subunit vaccine to protect their fish. The prevention of disease on salmon aquaculture sites serves to also protect sockeye from any concentrated source of the virus.

2. **Bacterial Kidney Disease (BKD)** Kent states that the disease is common in seawater-reared Pacific salmon but rare in farmed Atlantic salmon and sockeye are highly susceptible (p. 9).

Most enhanced sockeye are brooded in spawning channels where there is no opportunity to screen for this disease. In contrast, farmed salmon broodstock are intensively screened for BKD and eggs from positive fish are culled. A review of the BCSFA Fish Health Events database demonstrates a significant decline in reports of BKD from 2007 (20 cases) to 2009 (8 cases). Note also that most farms (59) raise Atlantic salmon which are much less susceptible to BKD; only 8 farms produce Pacific salmon (2009 BCMAL Fish Health Report).

Intense screening for BKD and the relatively low numbers of susceptible species greatly diminishes any risk that salmon farms may pose for BKD in sockeye salmon. The diminishing numbers of events associated with this agent demonstrates increasing success at reducing the impact of this disease in aquaculture. In addition, considering the documented risks from BKD from non-farm sources, salmon farms are likely of relatively minor importance as a potential source of infection for sockeye.

3. ***Aeromonas salmonicida*** Kent states that this pathogen has the potential to be lethal to juvenile and adult sockeye in both freshwater and salt water ( p. 9).

Note that all farmed salmon are vaccinated against this pathogen and disease caused by *Aeromonas salmonicida* was not identified in the BCSFA database between 2007 - 2009. Sockeye are at low or no risk from the possibility of *Aeromonas salmonicida* originating from salmon farms.

4. ***Vibrio anguillarum*** This ubiquitous environmental agent can be lethal to sockeye salmon, especially shortly after seawater entry (p. 9).

In 2008, only two cases of *Vibrio* sp. were identified in Pacific salmon in the BCSFA Fish Health Events database and no cases were reported in either 2007 or 2009. Considering the ubiquity of the pathogen in the marine environment and the low level experienced on salmon farms, it would appear that sockeye are at little risk of developing vibriosis from exposure to saltwater sea pens.

5. ***Ichthyophthirius multifiliis*** Can cause high mortality in sockeye, especially pre-spawning mortality. (p. 12).

This protozoa has not been reported on BC salmon farms.

6. ***Parvicapsula minibicornis*** Kent reports a high prevalence in adult sockeye as well as in outmigrating smolts. It has been demonstrated to be more severe in sockeye suffering pre-spawning mortality and also occurs in smolts shortly after seawater entry. (p. 14).

The agent has not been identified in farmed salmon in British Columbia.

Of the high-risk agents identified by Dr. Kent, salmon farms could only be reasonably considered as possible sources for two of them (IHN and BKD). As noted above, IHN would only be a factor on salmon farms if the agent were present in the wild. Sockeye adults are relatively resistant to the virus and its presence in Atlantic salmon would provide an early warning of its presence in the marine environment. Enhanced biosecurity on salmon farms and a high level of vaccinated fish mitigate against another significant outbreak of IHN.

BKD is most likely to occur in farmed Chinook and Coho salmon and its presence in these animals has been diminishing. It is unlikely that the low level of BKD in these farmed salmon poses any significant additional risk to that already present or encountered by sockeye in their marine environment.

## **Other Infectious Agents**

### **1. *Flavobacterium* spp.**

Although listed as only a moderate risk, Kent indicates that diseases caused by this agent have been observed in aquaculture and, in fact, are only recognized as a problem in captive animals (p. 10). Spawning adults are often infected by this opportunist and it caused high pre-spawning mortality in sockeye salmon in the Fraser River some four decades ago (p. 10).

In aquaculture, "mouthrot" primarily occurs in farmed Atlantic salmon shortly after saltwater entry and is an important cause of disease in that species. As the environmental source of the agent is unknown, it has been difficult to counter.

Kent notes that there is "**no evidence that *Flavobacterium* spp. infections and associated mortality have increased in the Fraser River in recent times**" (p. 10). *(in spite of problems that have been documented in aquaculture operations - RL).*

## 2. Sea Lice

a. Ocean surveys in June of 2010, revealed a prevalence of only about 4% ***Lepeophtheirus salmonis*** (<1 louse/fish) in sockeye salmon. Kent states there is **no direct indication that the parasite causes significant mortality in sockeye** (p. 18).

Note that *L. salmonis* is the most prevalent of the sea lice found in seawater netpens. This suggests that sea lice from salmon farms are not causing an associated problem in sockeye salmon.

b. ***Caligus clemensi*** is considered to be less pathogenic than *L. salmonis* and >70% of sockeye salmon were infected with from 1-16 lice/fish. (p. 18).

Note that ***Caligus* sp. is much less common on farm sites than *L. salmonis*; farm sites are unlikely to be a viable source of this louse for sockeye salmon.**

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